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Table of Contents

1	<i>Overview</i>	<i>3</i>
1.1	Pre-installation Steps	3
1.2	Notation	3
1.3	Directories of Note.....	3
1.4	Terminology	3
1.5	Affected Configuration Files	4
2	<i>Installing Graphics Generator Plug-ins.....</i>	<i>5</i>
2.1	Configuration File Changes (All Steps Required)	5
2.1.1	Modify Existing File: Explorer.xml.....	6
2.1.2	Modify Existing File: Filters.xml	7
2.1.3	Add New File: GraphGen.xml.....	8
2.1.4	Add New File: IdExportPiService.xml	11
2.1.5	Add New Icon Files.....	12
2.1.6	Add New Directory for the Local Area File.....	13
2.1.7	Add New Directory for the Central Area File	14
2.1.8	Modify Existing File: sa_global.properties/oc_global.properties	15
2.2	Confirm and Finalize the Installation	16
2.3	Synchronize Changes to the Central Server	20
3	<i>Setting Up Automated Graphics Generator Workflows</i>	<i>21</i>
3.1	General Preliminary Steps (All Steps Required)	21
3.1.1	Create Product Output Directory.....	21
3.1.2	Global Properties Changes.....	21
3.2	Other Steps (as Needed)	23
4	<i>Troubleshooting.....</i>	<i>24</i>

1 Overview

In addition to installing software, adding Graphics Generator into CHPS requires adding and updating FEWS configuration files, and using the FEWS GUI to finalize changes and verify the installation is successful. This guide provides instructions for installing the Graphics Generator components in the CHPS interface and general instructions for setting up automated workflows for creating Graphics Generator products.

In cases where a configuration file is new and generic (valid for all RFCs), the file is included in the release-package and added to the configuration. For cases where a configuration change contains text that is specific to an RFC (new or existing file) a description of the text and/or a sample file is provided.

1.1 *Pre-installation Steps*

Create an installation stand-alone for initial installation of Graphics Generator. Configuration changes made here will later be ported to an OC for synchronization to the central server, but only after installation is successful on a stand-alone.

1.2 *Notation*

Within this document, the following notation is used:

- All graphical interface components are **Capitalized and in Bold**.
- All XML snippets are in this font.
- All command line entries and global property snippets are in this font.
- All important terms are *italicized* when first mentioned.

1.3 *Directories of Note*

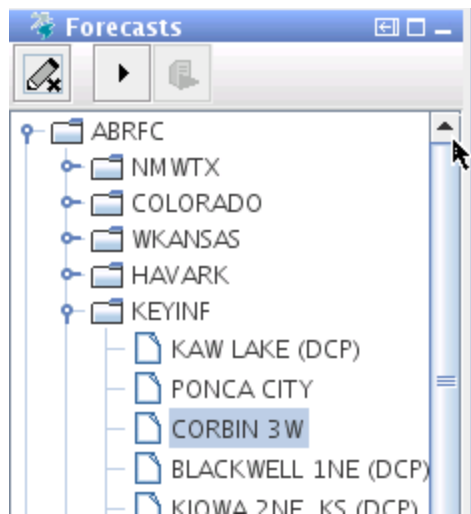
The following directories will be referred to in the instructions provided below:

- *<region_dir>*: The stand-alone region home directory, typically “###rfc_sa”.
- *<configuration_dir>*: The stand-alone Config directory, typically *<region_dir>/Config*.
- *<release_dir>*: The root directory of the untarred release package.
- *<central_area_dir>*: The directory to contain the final version (i.e., production version) of the Graphics Generator products and settings. See Section 4.4.3 of the *Graphics Generator Getting Started* guide.

1.4 *Terminology*

- *active forecast segment*: The current active segment, as selected in the **Forecasts Panel** of the CHPS interface and identified by the segment id set in the configuration file

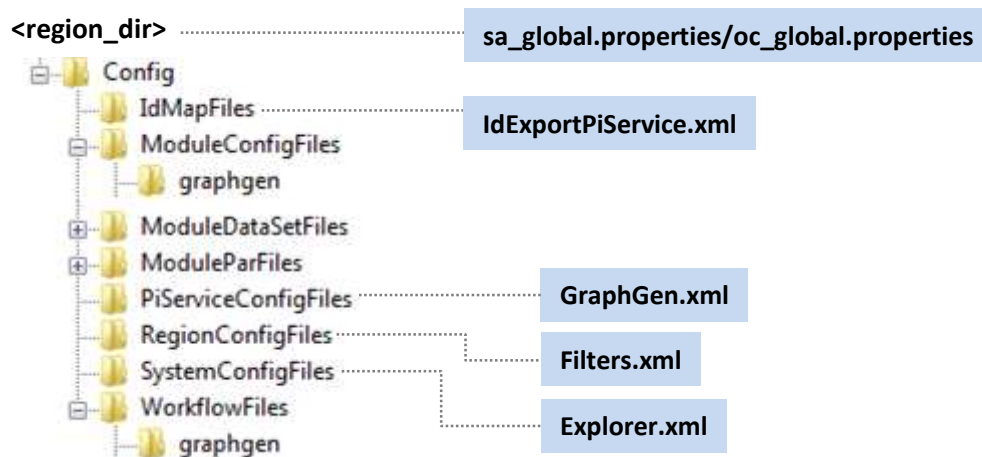
<configuration_dir>/RegionConfigFiles/Topology.xml. For example, for ABRFC, the active forecast segment in this case is CBNK1 (Corbin 3W):



- *installation stand-alone*: The stand-alone in which Graphics Generator will be installed, setup in Section 1.1.

1.5 Affected Configuration Files

The diagram below summarizes all configuration files affected by the installation steps provided in this document.



2 Installing Graphics Generator Plug-ins

This section provides instructions for installing the four Graphics Generator FEWS explorer plug-ins:

- **GraphGen Tree Panel:** Used to manage the Graphics Generator products, including importing, exporting, deleting, and renaming products.
- **GraphGen Thumbnails Panel:** Used to view a summary of products for an *active forecast segment*, each product being displayed as a thumbnail.
- **GraphGen Editor Panel:** Used to edit products.
- **GraphGen Viewer Panel:** Used to view products.

By the end of this section, the Graphics Generator software will be installed in the *installation stand-alone* with no products to display.

2.1 Configuration File Changes (All Steps Required)

Described below are changes that must be made to the configuration files in order for the Graphics Generator FEWS explorer plug-ins to function properly.

2.1.1 Modify Existing File: Explorer.xml

Action: Add explorer tasks to the file

`<configuration_dir>/SystemConfigFiles/Explorer.xml`

Text to add is provided in **bold** below; copy-and-paste it to the end of the explorerTasks element.

Description: Two tool bar buttons are added to the CHPS interface for the **GraphGen Editor Panel** and **GraphGen Viewer Panel**, and two tabs for the **GraphGen Tree Panel** and **GraphGen Thumbnails Panel**. This is confirmed later in Section 2.2.

Standard Location:	Contents:
<code><configuration_dir>/SystemConfigFiles/</code>	Explorer.xml
<pre> <region_dir> Config IdMapFiles ModuleConfigFiles graphgen ModuleDataSetFiles ModuleParFiles PiServiceConfigFiles RegionConfigFiles SystemConfigFiles Explorer.xml </pre>	<pre> <?xml version="1.0" encoding="UTF-8"?> <explorer version="1.1" xmlns="http://www.wldelft.nl/fews"... <explorerTasks> ... <!-- ADDED FOR GRAPHGEN --> <explorerTask name="GraphGen Editor"> <iconFile>graphGenEditor.png</iconFile> <taskClass>ohd.hseb.graphgen.GraphGenEditorExplorerPlugIn</taskClass> <toolbarTask>true</toolbarTask> <menubarTask>true</menubarTask> <allowMultipleInstances>>false</allowMultipleInstances> </explorerTask> <explorerTask name="GraphGen Viewer"> <iconFile>graphGenViewer.png</iconFile> <taskClass>ohd.hseb.graphgen.GraphGenViewerExplorerPlugIn</taskClass> <toolbarTask>true</toolbarTask> <menubarTask>true</menubarTask> <allowMultipleInstances>true</allowMultipleInstances> </explorerTask> <explorerTask name="GraphGen Tree"> <taskClass>ohd.hseb.graphgen.GraphGenTreeExplorerPlugIn</taskClass> <toolbarTask>>false</toolbarTask> <menubarTask>>false</menubarTask> <toolWindow>true</toolWindow> <loadAtStartup>true</loadAtStartup> </explorerTask> <explorerTask name="GraphGen Thumbnails"> <taskClass>ohd.hseb.graphgen.GraphGenThumbnailExplorerPlugIn</taskClass> <toolbarTask>>false</toolbarTask> <menubarTask>>false</menubarTask> <toolWindow>true</toolWindow> <loadAtStartup>true</loadAtStartup> </explorerTask> <!-- END --> </explorerTasks> ... </pre>

2.1.2 Modify Existing File: Filters.xml

Action: Add a filter with id “GraphGen” to the file

`<configuration_dir>/RegionConfigFiles/Filters.xml`

so that Graphics Generator can find location information via the FEWS PI-service.

Description: Graphics Generator loads information about locations from the FEWS PI-service. To do so, a filter must have id “GraphGen” and must refer to all locations for which Graphics Generator will be required to load location information, including latitude, longitude, short name and descriptive name (location information is defined in `<configuration_dir>/RegionConfigFiles/Locations.xml`). As the Filters.xml file defines the **Data Viewer Panel** in the CHPS interface, adding a “GraphGen” filter here will add a new entry by the name of “GraphGen” to that panel.

An example is provided below for ABRFC with the filter added for Graphics Generator in **bold**. The child added, in the example, is another filter named “ABRFC” which is a top level filter including many locations. In general, the children added to the filter will vary between RFCs and may need to include more than one child.



The CHPS **Data Viewer Panel** can be used to identify candidate “child” entries for the “GraphGen” filter.

Standard Location: <code><configuration_dir>/RegionConfigFiles/</code>	Contents: <i>Filters.xml</i>
<pre><region_dir> ├── Config │ ├── IdMapFiles │ ├── ModuleConfigFiles │ │ └── graphgen │ ├── ModuleDataSetFiles │ ├── ModuleParFiles │ ├── PiServiceConfigFiles │ └── RegionConfigFiles │ └── Filters.xml</pre>	<pre><?xml version="1.0" encoding="UTF-8"?> <filters version="1.1" xmlns="http://www.wldelft.nl/fews" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.wldelft.nl/fews http://chps1/schemas/filters.xsd"> ... <!-- ADDED FOR GRAPHGEN --> <filter id="GraphGen" name="GraphGen"> <child foreignKey="ABRFC"/> </filter> <!-- END --> </filters></pre>

2.1.3 Add New File: GraphGen.xml

Action: Create the directory `<configuration_dir>/PiServiceConfigFiles` if it does not yet exist. Copy the GraphGen.xml file from the release directory to the configuration directory:

```
cp <release_dir>/graphgen/Config/PiServiceConfigFiles/GraphGen.xml <configuration_dir>/PiServiceConfigFiles/.
```

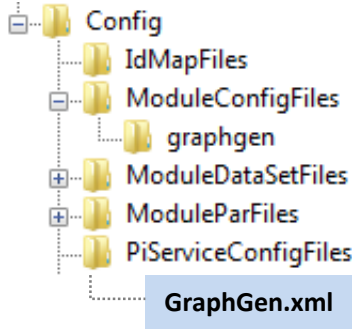
Description: This file defines the queries Graphics Generator uses to access the PI-service in order to acquire time series. The GraphGen.xml file defines the following queries for general use in Graphics Generator and for use in generating AHPS products ('Query ID' is the value of the `<id>` tag in the configuration file; 'Time Series to Return' is the type of time series that must be returned):

Query ID (<id> tag)	Time Series to Return
QIN	Observed streamflow time series
STG	Observed stage time series
QINE	Single-valued operational streamflow forecast (used to acquire thresholds for streamflow AHPS products)
SSTG	Single-valued operational stage forecast (may be used to acquire thresholds for stage AHPS products)
QINE ESP	ESP ensemble streamflow forecast (used in AHPS products)
SSTG ESP	ESP ensemble stage forecast (used in AHPS products)
QINE HS	Historical simulation (HS) ensemble streamflow forecast (created by sampling from a long historical simulation run) (used in AHPS products)
SSTG HS	Historical simulation (HS) ensemble stage forecast (used in AHPS products)
PELE HS	Historical simulation (HS) ensemble pool elevation forecast.
SQIN HS	Historical simulation (HS) ensemble simulated streamflow forecast (created by sampling from a long historical simulation run)
MAP ESP	Precipitation time series input used to generate an ESP streamflow or stage forecast (typically the output from a merge module)
MAT ESP	Temperature time series input used to generate an ESP streamflow or stage forecast (typically the output from a merge module)

The file is shown below with the RFC-specific contents of the time series sets replaced by "...". Those time series sets should be defined as needed, such as for the AHPS products as described in the *Graphics Generator AHPS Products Installation Guide*.



- Never change any of the query ids in the file. Query ids are defined within the XML tags `<id>...</id>`. Only the timeSeriesSet elements should (will) be modified.
- Forecast time series returned by a FEWS PI-service query are always the time series output by the most recently executed and approved workflow

Standard Location: <configuration_dir>/PiServiceConfigFiles/	Contents: <i>GraphGen.xml</i>
<p data-bbox="235 367 397 399"><region_dir></p> 	<pre data-bbox="673 325 1437 1879"> <?xml version="1.0" encoding="UTF-8"?> <fewsPiServiceConfig...> <general> <exportIdMap>IdExportPiService</exportIdMap> </general> <timeSeries> <id>selectedTimeSeries</id> <selectedTimeSeries></selectedTimeSeries> </timeSeries> <timeSeries> <id>selectedSegmentTimeSeries</id> <selectedSegmentTimeSeries></selectedSegmentTimeSeries> </timeSeries> <!-- Returns the observed streamflow --> <timeSeries> <id>QIN</id> <timeSeriesSet> ... </timeSeriesSet> </timeSeries> <!-- Returns the observed river stage --> <timeSeries> <id>STG</id> <timeSeriesSet> ... </timeSeriesSet> </timeSeries> <!-- Returns the deterministic forecast streamflow --> <timeSeries> <id>QINE</id> <timeSeriesSet> ... </timeSeriesSet> </timeSeries> <!-- Returns the deterministic forecast river stage --> <timeSeries> <id>SSTG</id> <timeSeriesSet> ... </timeSeriesSet> </timeSeries> <!-- Returns the standard ESP streamflow forecasts --> <timeSeries> <id>QINE ESP</id> <timeSeriesSet> ... </pre>

Standard Location:`<configuration_dir>/PiServiceConfigFiles/`**Contents: *GraphGen.xml***

```
</timeSeriesSet>
</timeSeries>

<!-- Returns the standard ESP river stage forecasts -->
<timeSeries>
  <id>SSTG ESP</id>
  <timeSeriesSet>
    ...
  </timeSeriesSet>
</timeSeries>

<!-- Returns the historical ESP streamflow forecasts -->
<timeSeries>
  <id>QINE HS</id>
  <timeSeriesSet>
    ...
  </timeSeriesSet>
</timeSeries>

<!-- Returns the historical ESP stage forecasts -->
<timeSeries>
  <id>SSTG HS</id>
  <timeSeriesSet>
    ...
  </timeSeriesSet>
</timeSeries>

<!-- Returns the precipitation ensembles used to generate the standard ESP
forecasts -->
<timeSeries>
  <id>MAP ESP</id>
  <timeSeriesSet>
    ...
  </timeSeriesSet>
</timeSeries>

<!-- Returns the temperature ensembles used to generate the standard ESP
forecasts -->
<timeSeries>
  <id>MAT ESP</id>
  <timeSeriesSet>
    ...
  </timeSeriesSet>
</timeSeries>

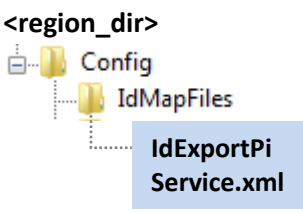
</fewsPiServiceConfig>
```

2.1.4 Add New File: IdExportPiService.xml

Action: Copy the file from the release directory to the configuration directory:

```
cp <release_dir>/graphgen/Config/IdMapFiles/IdExportPiService.xml <configuration_dir>/IdMapFiles/.
```



Description: This file provides the general id-mappings used by Graphics Generator for acquiring time series via the FEWS PI-service. Additions should be made to this file as needed for products displayed in Graphics Generator. For example, for AHPS products delivered with this release, see the *Graphics Generator AHPS Products Installation Guide*.

Standard Location:	Contents:
<code><configuration_dir>/IdMapFiles/</code> 	IdExportPiService.xml <pre><?xml version="1.0" encoding="UTF-8"?> <idMap xmlns="http://www.wldelft.nl/fews" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.1" xsi:schemaLocation="http://www.wldelft.nl/fews http://fews.wldelft.nl/schemas/version1.0/idMap.xsd"> <enableOneToOneMapping/> </idMap></pre>

2.1.5 Add New Icon Files

Action: Copy the files from the release directory to the configuration directory:

```
cp <release_dir>/graphgen/Config/IconFiles/* <configuration_dir>/IconFiles/.
```

Description: Without these files in place, the two buttons added to the tool bar to open the **GraphGen Editor Panel** and **GraphGen Viewer Panel** will not display the proper icons:  and  respectively.

2.1.6 Add New Directory for the Local Area File

Action: Create the Graphic Generator *local area* directory <region_dir>/Models/graphgen if it does not yet exist.

```
mkdir <region_dir>/Models/graphgen
```

Description: The *local area* is used to store products and settings for access by Graphics Generator components installed within an associated stand-alone. Changes made to products or settings within that stand-alone are recorded in the local area. The location of the *local area* is always <region_dir>/Models/graphgen. Graphics Generator will create and maintain an XML file named OHD_GRAPHGEN_PRODUCTS_AND_SETTINGS.xml automatically in this directory. Users are not suggested to create or edit this file.

2.1.7 Add New Directory for the Central Area File

Action: Create the Graphic Generator *central area* directory if it does not yet exist.

```
mkdir <central_area_dir>
```

Copy the contents of the delivered central area directory to the selected directory:

```
cp <release_dir>/graphgen/ohdGraphgenCentralDir/* <central_area_dir>
```

This puts the file helpManual.pdf into the central area, which is required for help functionality in the **GraphGen Editor Panel**.

Description: The *central area* is primarily used to store products and settings that are considered ready for production. The products and settings are stored in an XML file named OHD_GRAPHGEN_PRODUCTS_AND_SETTINGS.xml. The products and settings in the *central area* file should never be edited directly by the user. The *central area* can be anywhere on the system depending on the installation environment, so long as these requirements are satisfied:

1. The user has read/write permissions on this directory.
2. It is not the same directory as the *local area* defined in Section 2.1.6.
3. The *central area* is visible to all instances of CHPS/FEWS (i.e., all SA's, OC's, and FSS's) that need access to the products, including that which executes a scheduled workflow and the stand-alone used for product editing.

On a machine that runs CHPS, the recommended <central_area_dir> directory is the following (be sure to create the directory!):

```
/awips/chps_share/ohd/graphgen
```



Although the *central area* file has the same file name as the *local area* file described in Section 2.1.6, they should not be confused. They are independent of each other until the **Upload Product** or the **Download Product Button** has been clicked in the **GraphGen Tree Panel**:



When the **Upload Product Button** is clicked, the content of the *local area* file is copied to the *central area* file. When the **Download Product Button** is clicked, the content of the *central area* file is copied to the *local area* file. Both actions synchronize the two area files, making them identical.

2.1.8 Modify Existing File: sa_global.properties/oc_global.properties

Action: Add a new property, “ohdGraphgenCentralDir”, to the file

`<region_dir>/sa_global.properties` or `<region_dir>/oc_global.properties`

Such that the “ohdGraphgenCentralDir” property has the same value as the `<central_area_dir>` created in Section 2.1.7. The file `sa_global.properties` is the global property file for a CHPS SA, and `oc_global.properties` is the global property file for a CHPS OC.


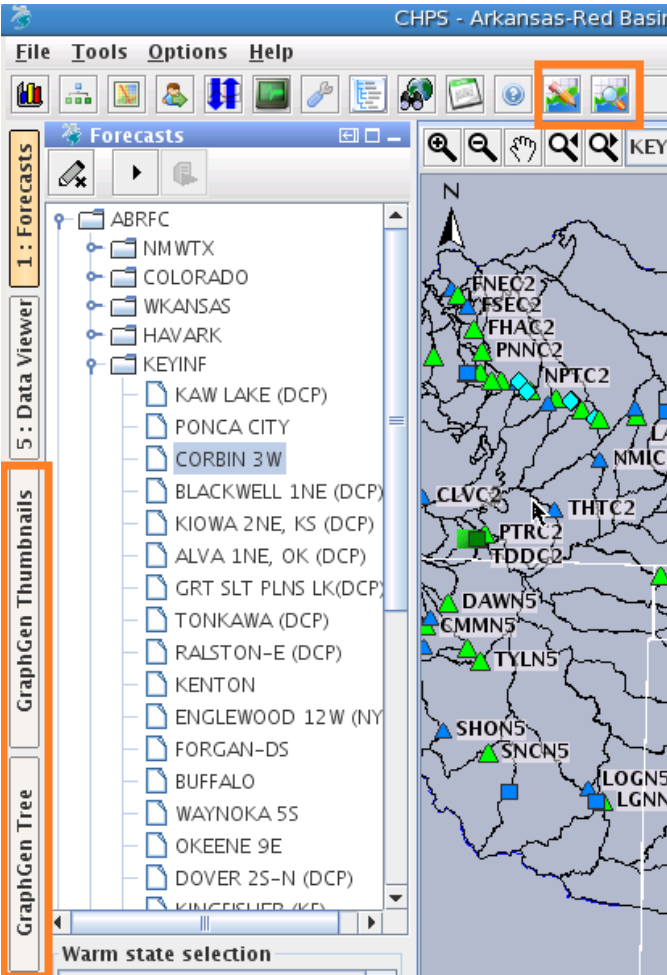
Description: The Graphics Generator needs this global property to know where to find the *central area* file.



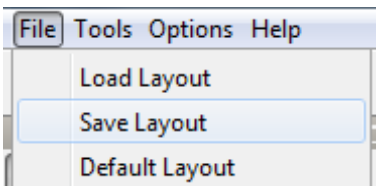

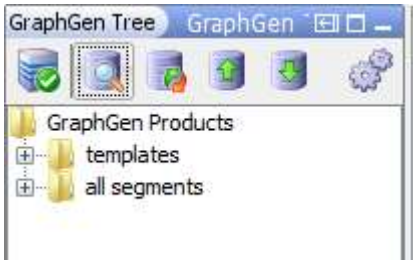

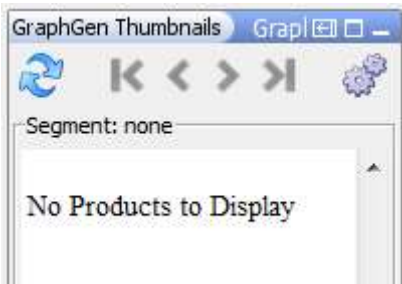
For example, the new property can be specified as following.


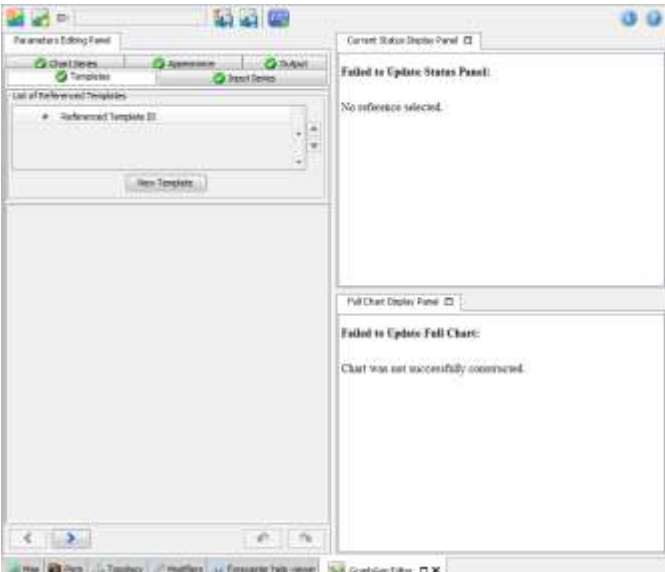
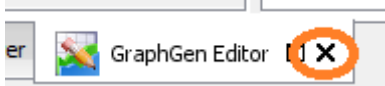

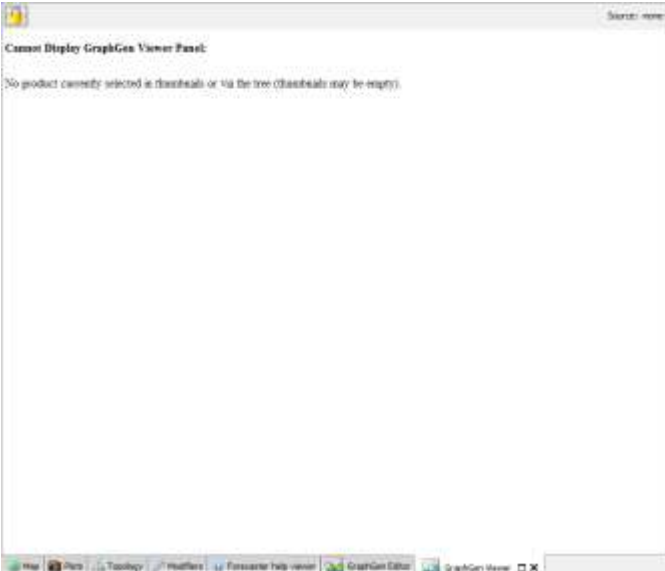
Standard Location:	Contents:
<code><region_dir>/</code>	<code>sa_global.properties</code>
<code><region_dir></code>	...
<code>sa_global.properties</code>	ohdGraphgenCentralDir=" <code><central_area_dir></code> "


2.2 Confirm and Finalize the Installation

Described below are steps to perform to test that the installation was successful. Perform the following steps and confirm the expected results:

#	Action	Expected Results
1	<p>Start FEWS using the installation standalone:</p> <pre>cd <region_dir> cd .. ./ohdPlugins/fews_ohdPlugins.sh ##rfc_sa &</pre>	<p>FEWS will be started. The splash screen displayed will vary by RFC. The default splash screen is:</p>  <p>After a short time, the CHPS interface will open (new Graphics Generator plug-in buttons and tabs are highlighted):</p> 

#	Action	Expected Results
2	<p>Click and drag the  tab from the left border to the right so that it is below the Plot Overview Tab.</p>	<p>The GraphGen Thumbnail Tab will be displayed on the right:</p> 
3	<p>Click on Save Layout in the File Menu:</p> 	<p>The layout will be saved so that the next time this stand-alone is started, the GraphGen Thumbnails Tab will be displayed on the right.</p>
4	<p>Click on the  (tab) on the left.</p>	<p>An empty GraphGen Tree Panel will be displayed on the left:</p> 
5	<p>Click on the  (tab) on the right.</p>	<p>The GraphGen Thumbnails Panel will be displayed on the right showing that there is no active segment and no products to display:</p> 

#	Action	Expected Results
6	<p>Click on the GraphGen Editor Button, , in the CHPS interface main toolbar.</p>	<p>The GraphGen Editor Panel will be displayed in the middle of the CHPS interface showing an empty product:</p> 
7	<p>Close the GraphGen Editor Panel by clicking on the X next to its name in the tab:</p> 	<p>The GraphGen Editor Panel will close.</p>
8	<p>Click on the GraphGen Viewer Button, , in the CHPS interface main toolbar.</p>	<p>The GraphGen Viewer Panel will be displayed in the middle of the CHPS interface showing that no product is selected for viewing:</p> 

#	Action	Expected Results
9	<p>Close the GraphGen Viewer Panel by clicking on the X next to its name in the tab:</p> 	The GraphGen Viewer Panel will close.

2.3 *Synchronize Changes to the Central Server*

Once the installation steps above are complete, including confirmation, port all of the configuration changes to the central server. Two files are modified (see Sections 2.1.1 and 2.1.2), while the others are all new (see Sections 2.1.3, 2.1.4, and 2.1.5). Use the FEWS configuration manager (cm) tool for installing the files in the central server (place the changes in the FEWS OC, and synchronize/upload the changes).



After making changes to the FEWS OC, you can repeat Section 0 to verify that the changes are in the OC. Perform the appropriate command to start the OC session in Step 1.

3 Setting Up Automated Graphics Generator Workflows

This section provides general instructions for setting up scheduled tasks in CHPS to execute workflows that generate Graphics Generator products. Specific instructions for products delivered by OHD are provided with installation instructions for those products. For example, for the AHPS products, instructions are provided in *Graphics Generator AHPS Products Installation Guide*.

The steps described in Section 3.1 should be performed now in preparation for adding automated workflows in the future. The steps in Section 3.2 should be performed as needed and are intended as general steps (do not perform them now); products specific instructions will be provided upon delivery by OHD.

3.1 General Preliminary Steps (All Steps Required)

3.1.1 Create Product Output Directory

Action: Create a products directory in the standard export directory; for example:

```
$EXPORT_DIR$/products -or- $EXPORT_FOLDER$/products
```

The value of EXPORT_DIR or EXPORT_FOLDER is specified in the global properties.

Description: This is the default directory to store the output products; products can be generated in other directories, but all output products generated by Graphics Generator for products delivered by OHD will be created under this directory. This directory will always be used as the baseOutputDir run-information file property for all executions of the Graphics Generator Model Adapter for products delivered by OHD (see Section 3.2).

3.1.2 Global Properties Changes

Action: Open the file

```
/awips/chps_local/fss/??rfc/FSS##/FewsShell/??rfc/fss_global.properties
```

where ?? is the appropriate two-letter RFC abbreviation and ## is the appropriate forecast shell server number. Add the following at the bottom:

```
piServiceBackendRFCIdentifier=??rfc_pi  
piServiceHostName=localhost  
piServicePortNumber=<service_number>  
ohdGraphgenCentralDir=<central_area_dir>
```

where ??, again, is the appropriate 2 letter RFC abbreviation and *<service_number>* is one of the following:

Location	Backend PI Service Port Number	Location	Backend PI Service Port Number	Location	Backend PI Service Port Number
nhor	2001	lmrfc	2007	cnrfc	2013
ohrfc	2002	abrfc	2008	aprfc	2014
nerfc	2003	mbrfc	2009	nhdr	2009
marfc	2004	ncrfc	2010		
serfc	2005	nwrfc	2011		
wgrfc	2006	cbrfc	2012		

<central_area_dir> is a directory path to the products and settings central area, as specified by the global properties *ohdGraphgenCentralDir*, or to a CHPS stand-alone local area.

Repeat this change for each Forecast Shell Server (FSS).

Description: The FEWS PI-service is used by Graphics Generator to:

- identify the system time,
- identify the active forecast segment id and filter selections,
- acquire location information, and
- acquire time series from FEWS.

To access the FEWS PI-service, GraphGen must know the PI-service hostname and port number. Since GraphGen will be executed within a scheduled workflow, the hostname and port number must be identified in advance by changing the global properties file for each FSS.

GraphGen uses a products and settings file that is an XML file to store products and settings. To access the products and settings, GraphGen must know the location of the file. The property *ohdGraphgenCentralDir* must be defined.



The changes above can be made to a stand-alone or operator client (OC) *global.properties file to direct Graphics Generator to use the back-end FEWS PI-service or the back-end products and settings central area directory when executed interactively via the SA or OC. However, that should generally not be needed. When executed interactively, Graphics Generator should access that session FEWS PI-service and central and local products and settings files (see Section 2.3 of the *Graphics Generator Tips and Troubleshooting Guide*), not the back-end PI-service and the back-end products and settings central area file (except possibly for problem identification and debugging purposes).

3.2 *Other Steps (as Needed)*

All other steps to perform to setup an automated Graphics Generator workflow are products specific. The following general steps are required:

1. Create module(s) to execute the Graphics Generator Model Adapter to create the desired products.
2. Create a workflow to execute the module(s) created in the previous step.
3. Add to the files `<configuration_dir>/RegionConfigFiles/ModuleInstanceDescriptors.xml` and `<configuration_dir>/RegionConfigFiles/WorkflowDescriptors.xml` appropriately
4. Synchronized configuration changes with the central server.
5. Schedule a task to execute the workflow at the appropriate time each day with the appropriate system time to acquire the needed data for product generation.

Upon completion of these steps, the products will be created at the scheduled time, yielding files as specified within the product definition via the **Output Panel** of the **GraphGen Editor Panel** under the directory specified in the adapter configuration file.

4 Troubleshooting

General trouble shooting tips applicable here and are provided in the *Graphics Generator Tips and Troubleshooting Guide*.